Date: Wed, 11 Aug 93 04:30:23 PDT
From: Ham-Homebrew Mailing List and Newsgroup <ham-homebrew@ucsd.edu>
Errors-To: Ham-Homebrew-Errors@UCSD.Edu
Reply-To: Ham-Homebrew@UCSD.Edu
Precedence: Bulk
Subject: Ham-Homebrew Digest V93 #7
To: Ham-Homebrew

Ham-Homebrew Digest Wed, 11 Aug 93 Volume 93 : Issue 7

Today's Topics:

Date: Tue, 10 Aug 1993 17:35:02 GMT
From: pravda.sdsc.edu!news.cerf.net!usc!sol.ctr.columbia.edu!news.unomaha.edu!cwis.unomaha.edu!ncc2001@network.ucsd.edu
Subject: 6m xcvr
To: ham-homebrew@ucsd.edu

Does anybody out there have or know of plans for a homebrew 6m xcvr? I'm waiting for my license and I figure that by the time the FCC gets it to me, I could have the 6m rig up and ready. Any and all replies welcome.

73's

Michael

--

```
|  Michael Fortner                * "I've got all this love to give and  |
|  N0???  (11 weeks and counting) *  so far all I have is my ham radio"  |
|  ncc2001@cwis.unomaha.edu       *      -Selma Bouvier (Marge's sister) |
```

Date: Tue, 10 Aug 1993 14:20:15 GMT
From: pacbell.com!sjhawk2@network.ucsd.edu
Subject: Cubic Incher
To: ham-homebrew@ucsd.edu

Date: Tue, 10 Aug 1993 14:12:58 GMT
From: pacbell.com!sjhawk2@network.ucsd.edu
Subject: Cubic Incher
To: ham-homebrew@ucsd.edu

I saw a remark the other day that refered to a kit by someone in the U.S. called a "Cubic Incher". From what I could glean it is some kind of qrp transmitter. If anyone knows much about the Cubic Incher please tell me about it by Email. Thanks Steve Hawkins WV6U 73 49 0100 1001

Date: Tue, 10 Aug 1993 20:57:47 GMT
From: pa.dec.com!nntpd2.cxo.dec.com!bobseg.enet.dec.com!segrest@decwrl.dec.com
Subject: Looking for Yaesu FT-736 Schematic
To: ham-homebrew@ucsd.edu

A while back someone suggested that I use an off the shelf IF filter for a RCA-700 radio project that I was asking about. As a result I am now the proud owner of several "LHS-20" 20kc wide filters made by Yaesu for the FT-736.

Is there any chance that anyone can help me locate the pinouts for these devices?

Looking from the bottom the pins look something like:

```
                      X
                X X X X
```

How about checking your schematic and tell me which pin is which....?

--
Bob Segrest, KD4PWU
segrest@bobseg.enet.dec.com

Date: 10 Aug 93 11:09:56 est
From: psinntp!arrl.org@uunet.uu.net
Subject: Single-Frequency Receiver
To: ham-homebrew@ucsd.edu

I haven't had the time to follow all of the discussion on this thread, but will now add mine to the stew because its initiator -- richard@alaska.et.byu.edu, who I regrettably can't easily refer to by his full name because I no longer have a full copy of his message -- sent out info requests both to newsgroups and individuals. Here, somewhat annotated (in the form of "afterthoughts," is my response to Richard's email direct to me.

Background: I took the approach that what Richard is after is not an asymptotic discussion on what "should" go into "the ultimate mediumwave receiver" (there's no single such thing because of goal variability), but an *actual buildable* radio the design of which springs from a defined application. True, that definition isn't stated numerically -- good thing, since I'm not a degreed engineer -- but experience with the technology can suggest a few approaches to achieving the class of performance he seeks without requiring the reinvention of the wheel, or even resorting to the latest possible wheel. Those with a yen for numbers can (and will) likely want to say more.

On we go:

>I think I have a unique question for you or you friends there at ARRL.
>
>There is a radio station here in Utah that covers event here at BYU
>(Brigham Young Universtiy - Provo, Utah). It is KSL 1160 kHz. I am
>lucky that it is a clear channel station operating at 50 kW.

Yes. You should be aware, however, that there is actually no longer any such thing as a "clear-channel" station -- in fact or by regulation. FCC abolished the concept sometime ago. The 1994 *World Radio TV Handbook* shows that between 15 and 25 US stations operate on 1160 at night. Their coverage is restricted by power and antenna pattern, but you should be aware that they may considerably limit your ability to receive KSL around the US at night. (You might do as well or better to find out if the BYU feed is available via some single channel per carrier [SCPC] satellite downlink and develop a portable system to receive same... :-))

>I want to design and build a radio that is optimised to recieve this
>station at great distances. The radio can be broken down in four
>categories. Antenna - Narrow band Pre-amp - Filter - mixer and/or
>mixer - audio.

>I have been reading a lot of books for help and these are the
>conclusion I have come to.
>
>A. The ferrite core of the antenna needs to be long and wide. I
>intend to make it 1"x20". The coil should exist over most of the
>length of the rod so that the maximum number of turns for a given
>inductance is achieved. Also the amount of inductance should be
>minimized to increase the S/N ratio. I have chosen 70 microH. for
>the design. This also increase the possible Q.
>
>B. The design of the antenna and the pre-amp is going to be as
>symetrical as possible all enclosed in an electrostatic shield to make
>sure the null is the deepest it can be.

Okay -- the details are largely beyond me -- but don't be
disappointed when you discover that nearby metal objects shift
the null and/or make it shallower. You will not be able to
achieve the null depth your math predicts, and your antenna's
pattern shape will vary with the presence of surrounding
conductors.

+WJ1Z afterthought: Pursuing "high-Q-ness" to extreme in a loop
+made for this frequency range can easily cut received-signal
+sidebands. As an analogy, it's also nontrivial for transmitter
+designers "down here" to contend with possible amplifier and
+modulator instability due to narrow antenna-array SWR bandwidths.

>C. The filter is either going to be an RL or a crystal filter. This
>part I haven't really thought about yet.

Don't drive yourself nuts with details. (I see that your project
has sparked quite a lot of hundredth-of-a-decibel hand-wringing
in at least one of the ham newsgroups. Remember that you are
after something *practical*.) MuRata and others make ceramic IF
filters that will do just fine for your application. I recommend
an IF bandwidth of around 6 kHz (you're going to tune off to
either side for demodulation, so you'll be able to get audio
highs up to 4 to 6 kHz, depending on how you tune.) A -60- to
-6-dB shape factor of 2 is emminently buyable. So a filter that's
6 kHz wide at -6 dB and 12 kHz wide at -60 dB should be fine.
(You may need to cascade filters to achieve this 2:1 number.)

+WJ1Z Afterthought: Remember, the application is BYU basketball audio,

+not CD-quality freq response. We don't need resp out beyond 5 kHz,
+esp if getting it will compromise the RF performance of the radio.
+Keeping in-band IMD down, a separate issue, is worthwhile,
+however.

Remember that your antenna will add to this selectivity somewhat,
through its bandwidth *and* (in effect) through its directivity.
The nearest channels you must worry much about (I'm disregarding
"splits"--foreign stations operating on other than 10-kHz
spacing) are 1150 and 1170. The antenna selectivity will help
your receiver's front end materially, and greatly reduce the
attention you must pay to front-end "strength." In this
connection, though, use only enough preamplification to make up
for antenna inefficiency and slightly overcome your mixer's noise
(or loss).

>D. Mixer/Detector   This is the part I have a question on. Which
>method is the best for my type of reception. I know of the following
>types.
>
>1. I could use a MC1496 and directly modulate the signal to the
>audio band.
>2. Just use a diode detector and don't mess with anything else.
>3. Use a diode ring or JFET ring like the SD8901
>4. Use a single JFET
>5. Use a PLL.

Use a doubly balanced diode-ring mixer (Mini-Circuits SBL-1 will
do fine) to convert KSL to 455 kHz. Good idea to use a
high-standing-current transistor (or two in push-pull) as a
post-mixer amplifier. Use one or two MC1350P ICs for
automatic-gain-controlled IF amplifiers. (One is better than two
if one gives you enough gain and AGC range. I say this because an
IF amplifier must have sufficient output headroom to handle
without crunchy-sounding overload distortion the power peaks
present in double-sideband, full-carrier signals. [This issue is
largely unknown to many ham-transceiver users, who also commonly
wonder why their "100-watt" SSB transmitters are rated for "only"
25 watts, carrier, for full-carrier, double-sideband AM...] More
IF gain than you need can throw away IF headroom necessary and
disallow hi-fi AM reception.

+WJ1Z afterthought: Even a low-Q SWLesque air-core loop will have
+a 3-dB bandwidth no greater than a single channel width or so over
+much of the standard broadcast range. *And* the incoming signals
+are channelized and placed according to a knowable scheme. This
+significantly relaxes the associated front end's IMD-resistance
+requirements compared what our MF/HF radios must contend with in

+unchannelized/random search/pileup situations.

You don't have to worry about AGC attack/decay times for MF AM reception in the way that hams do, since the carrier sets the AGC level and will not change strength rapidly enough to matter. (Hams receiving Morse and carrierless SSB voice signals need AGC capable of responding favorably to sudden, repetitive signal onsets.) This doesn't mean you need pay no attention to AGC attack/decay; you must be sure your AGC system cannot respond rapidly enough to flatten low-freq-audio modulation peaks.

>Would you happen to know which of these methods or another one that
>you know about would be the best to use for weak signal listening.

Again, don't drive yourself wild with details. Stay away from using *only* "diode" ("envelope," "rectification") detection because skywave signals at MF are subject to l o n g selective fades that can attenuate the carrier for periods of seconds to minutes. A diode detector needs carrier to heterodyne the sidebands back to audio, so carrier troughs make recovered audio sound awful. If you use a diode detector, all of your careful engineering work will give you recovered audio no better than any old AM radio -- but you deserve better.

+WJ1Z afterthought: I did not mention that diodes have a
+detection threshold. (No, biasing them close to conduction
+causes other problems. And anyway a diode requires solid carrier
+to work +well.) The article I'm about to mention does, however.

To get around this problem in a way that won't drive you nuts reinventing the wheel, build the synchronous detector featured in July 1993 *QST* (pages 28-33). It operates at 455 kHz and provides true synchronous detection (PLL-controlled local carrier reinsertion during heterodyne detection). I prepared this article for *QST* and daily use my version of the circuit for shortwave reception; it does wonders to kill distortion attributable to carrier troughs caused by rapid selective fading on shortwave. It can hold lock right down to the noise -- well beyond the point at which you'll be able to distinguish KSL's BYU play-by-play from the hiss. *And* its NE602 sync detector has sufficient headroom so modulation peaks don't get clipped.

Be sure to feed your radio's AGC detector (which can be just a diode) and synchronous detectors via different buffer amplifiers -- that is, don't just "Y" the AGC/audio-detector inputs. Otherwise, your sync detector will receive the IMD generated by the AGC diode.

Have fun!

73, Dave/WJ1Z

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End of Ham-Homebrew Digest V93 #7
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